construction and operations. As discussed in Section 6.3.2.1, in areas where a branch rail line or variation passed near a community, transports could be limited to the extent necessary to ensure that noise was below levels listed as accepted noise hazards.

The estimated population that would reside within 2 kilometers (1.3 miles) of the Jean Corridor in 2035 is about 1,300 persons.

Vibration. The Jean Corridor and its variations would be distant [more than 200 meters (660 feet)] from historic structures and buildings. There are no known ruins of cultural significance along the corridor. Therefore, vibration impacts to structures would be unlikely. The small number of trips (three per day) and the small train size would result in low levels of rail-induced ground vibration.

6.3.2.2.4.8 Jean Rail Aesthetics

The Wilson Pass Option of the Jean Corridor would pass through Class II lands in the Goodsprings Valley and Spring Mountains. The objective of Bureau of Land Management Visual Resource Class II lands is to preserve the existing character of the landscape. According to the Bureau, the level of changes to the landscape should be low. Management activities could be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture of the characteristic landscape. Because of this, the building of a rail line in the Wilson Pass Option probably would require more stringent construction practices to limit visual resource impacts. Although impacts due to construction activities would be short term, visual impacts to recreational land use in this area would be likely. If DOE selected this option, additional consultation with the Bureau would be necessary to address aesthetic impacts.

The operation of a branch rail line through the Class II visual resource lands in the vicinity of Wilson Pass in the Spring Mountains would draw attention to the rail line and degrade the aesthetics of the area, thereby reducing the quality of recreational use of the area.

6.3.2.2.4.9 Jean Rail Utilities, Energy, and Materials

Table 6-69 lists the use of fossil fuels and other materials in the construction of a Jean branch rail line.

Table 6-69. Construction utilities, energy, and materials for a Jean branch rail line.

Route	Length (kilometers)[a]	Diesel fuel use (million liters)[b]	Gasoline use (thousand liters)	Steel (thousand metric tons)[c]	Concrete (thousand metric tons)
Jean	180 - 200	26 - 30	500 - 570	26 - 29	150 - 170

a. To convert kilometers to miles, multiply by 0.62137.
b. To convert liters to gallons, multiply by 0.26418.
c. To convert metric tons to tons, multiply by 1.1023.

6.3.2.2.5 *Valley Modified Corridor Implementing Alternative*

The Valley Modified Corridor originates near the existing Apex rail siding off the Union Pacific mainline railroad. It travels northwest passing north of the City of Las Vegas, north of the Town of Indian Springs, parallel to U.S. 95 before entering the southwest corner of the Nevada Test Site and reaching the Yucca Mountain site. The Valley Modified Corridor is about 159 kilometers (98 miles) long from its link with the Union Pacific line to the site. Variations of the route range from 157 to 163 kilometers (98 to 101 miles). Figure 6-19 shows this corridor along with possible variations identified by engineering studies (DIRS 154960-CRWMS M&O 1998, all). The variations provide flexibility in addressing engineering, land-use, or environmental resource issues that could arise in a future, more detailed survey along the corridor. This section addresses impacts that would occur along the corridor shown in Figure 6-19. With the exception of differences identified in Appendix J, Section J.3.1.2, the impacts would be generally the

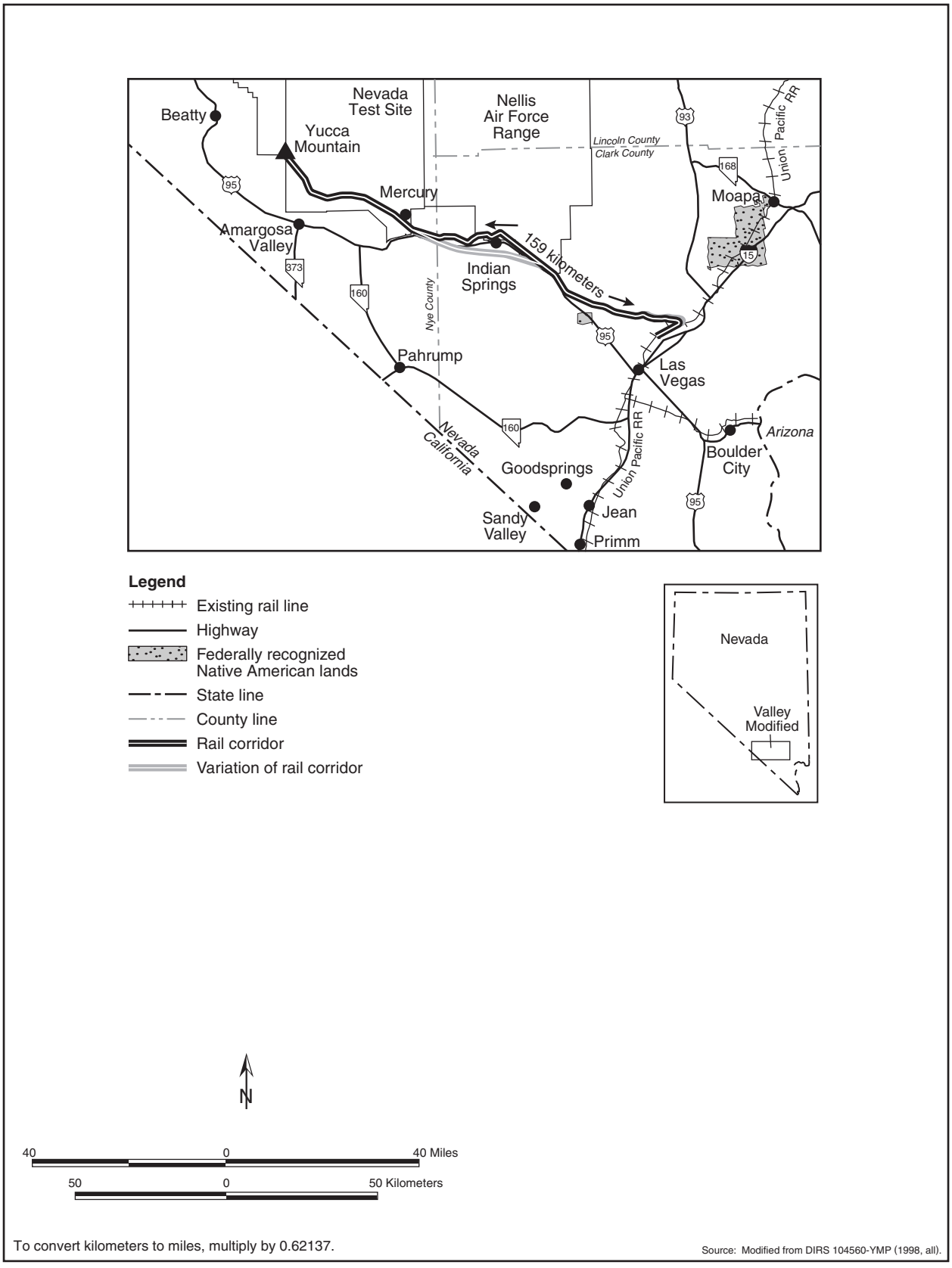

Figure 6-19. Valley Modified Corridor.

same among the possible variations. The Indian Hills Alternate of the Valley Modified Corridor also crosses the original route of the historic Las Vegas-to-Bullfrog Stage Road.

The construction of a branch rail line in the corridor would require approximately 40 months. Construction would take place simultaneously at a number of locations along the corridor. Two construction camps would be established to provide temporary living accommodations for construction workers and construction support facilities. A train would take about 3 hours to travel from the junction with the Union Pacific mainline to the Yucca Mountain Repository on a Valley Modified branch rail line (DIRS 101214-CRWMS M&O 1996, Volume 1, Section 4, Branch Rail Operations Plan). The estimated life-cycle cost to construct and operate a branch rail line in the Valley Modified Corridor would be $283 million in 2001 dollars.

The following sections address impacts that would occur to land use; air quality; biological resources and soils; hydrology including surface water and groundwater; cultural resources; occupational and public health and safety; socioeconomics; noise and vibration; and utilities, energy, and materials. Impacts that would occur to aesthetics, and waste management would be the same as those discussed in Section 6.3.2.1 and are, therefore, not repeated here. Section 6.3.4 discusses the potential for transportation activities to cause environmental justice impacts in Nevada.

6.3.2.2.5.1 Valley Modified Rail Land Use and Ownership

Table 6-70 summarizes the amount of land required for the Valley Modified corridor, its ownership, and the estimated amount of land that would be disturbed, as well as ranges for the variations. Table 6-71 summarizes the amount of land required for the variations of the Valley Modified Corridor and its ownership.

Table 6-70. Land use in the Valley Modified Corridor.[a]

Factor	Corridor (percent)	Range due to variations
Corridor length (kilometers)[b]	159	157 - 163
Land area in 400-meter[c]*-wide corridor (square kilometers)*[d]	63 (100)	63 - 65
Land ownership in 400-meter-wide corridor (square kilometers)		
Bureau of Land Management	34 (53)[e]	29.9 - 36.7
Air Force	7 (11)	3.6 - 7.5
DOE	21 (32)	20. 6 - 20.6
Private	0.2 (0.3)	0 - 0.18
Fish and Wildlife Service	1.8 (3)	1.7 - 4.1
Land area in 60-meter[f] *right-of-way (square kilometers)*	9.6	9.4 - 9.8
Disturbed land (square kilometers)		
Inside 60-meter right-of-way	4.4	4.3 - 4.5
Outside 60-meter right-of-way	0.6	0.68 - 0.7

a. Source: DIRS 155549-Skorska (2001, all).
b. To convert kilometers to miles, multiply by 0.62137.
c. 400 meters = about 0.25 mile.
d. To convert square kilometers to acres, multiply by 247.1.
e. Percentages do not total 100 due to rounding.
f. 60 meters = 200 feet.

Construction. The corridor crosses three Bureau of Land Management grazing allotments (Wheeler Slope, Indian Springs, and Las Vegas Valley), two wilderness study areas (Nellis ABC and Quail Spring, both recommended by the Bureau as unsuitable for inclusion in the National Wilderness System), and one area designated as available for sale or transfer (DIRS 104993-CRWMS M&O 1999, Table 7, p. 22). It also crosses several telephone, pipeline, highway, and power line rights-of-way, and the Nellis Air Force Base small arms range. Impacts common to rail implementing alternates are discussed in Section 6.3.2.1. The following paragraphs discuss impacts unique to this corridor.

Table 6-71. Variations in the Valley Modified Corridor.[a]

Variation	Length (kilometers)[b]	Land area in variation (square kilometers)[c]	Land ownership [square kilometers (percent)]			
			Bureau of Land Management	Fish and Wildlife Service	Department of Defense	Private
Indian Hills Alternate	45.2	18.1	18.1 (100)	--[d]	--	--
Sheep Mountain Alternate	23.3	9.8	3.2 (33)	3.4 (35)	3.1 (32)	--
Valley Connection	21.1	2.7	2.5 (93)	--	0.01 (0.4)	0.2 (6.6)

a. Source: DIRS 155549-Skorska (2001, all).
b. To convert kilometers to miles, multiply by 0.62137.
c. To convert square kilometers to acres, multiply by 247.1.
d. -- = none.

Variations to this corridor are listed in Appendix J, Section J.3.1.2. The Indian Hills Alternate would avoid Nellis Air Force Range by traveling south of Indian Springs. This variation would cross Fish and Wildlife Service lands and pass almost entirely within a Bureau of Land Management utility corridor. It would also pass through a Bureau Land Withdrawal Area (N50945) for a power project. The Sheep Mountain Alternate would pass through the Nellis Small Arms Range and Nellis Wilderness Study Areas A, B, and C, as well as the Quail Mountain Wilderness Study Area and the Desert National Wildlife Range. Although the Bureau considers these Wilderness Study Areas unsuitable for inclusion in the National Wilderness System, DOE would have to consult with the Bureau before it could build a branch rail line.

The corridor passes along the Las Vegas metropolitan area's northern boundary, in an area that is currently undergoing growth and where future commercial and residential growth might occur. However, metropolitan area growth might not extend to the corridor area until after the operations phase of the repository, when DOE assumes that it would no longer have use for a branch rail line. The corridor also passes next to the Dry Lake siding and within about 1.6 kilometers (1 mile) of the Las Vegas Paiute Indian Reservation north of Las Vegas. There would be no significant land-use impact to this reservation because of its distance from the corridor.

During the construction and operation and monitoring phases of the Proposed Action, there would be a potential for encroachment of the Valley Modified Corridor by private interests. If encroachment occurred, conflicts could result as impediments to the full use of lands. Areas most likely for use by private interests are those currently designated for sale or transfer by the Bureau of Land Management.

Two segments of the corridor encroach slightly on the Nellis Air Force Range. The U.S. Air Force has noted the potential for safety risks of crossing lands that are hazard areas and encompass weapons safety footprints for live weapons deployment. DOE has identified the Indian Hills Alternate, which would avoid the larger encroachment (see Appendix J, Section J.3.1.2). If DOE decided to build and operate a branch rail line in the Valley Modified corridor, it would consult with the Bureau of Land Management, U.S. Air Force, other affected agencies and Native American Tribal governments, and other DOE program operations on the Nevada Test Site to help ensure that it avoided or mitigated potential land-use conflicts associated with alignment of a rail line right-of-way. Because the Military Lands Withdrawal Act of 1999 (Public Law 106-65; 113 Stat. 885) withdraws and reserves the Nellis Air Force Range for use by the Secretary of the Air Force, the Secretary would need to concur with a decision to build and operate a branch rail line through any part of the Range.

Although there are no known community development plans that would conflict with the rail line, the presence of a rail line could influence future development and land use along the railroad in the communities of Indian Springs and North Las Vegas (that is, zoning and land use might differ depending on the presence or absence of a railroad).

Operations. DOE anticipates that operations along the Valley Modified Corridor would cause fewer impacts than construction. Operations impacts would be similar to those discussed in Section 6.3.2.1.

6.3.2.2.5.2 Valley Modified Rail Air Quality

Construction. The Valley Modified Corridor and some of its variations would involve construction in the Las Vegas Valley air basin, which is in nonattainment for particulate matter (PM_{10}) and carbon monoxide (DIRS 101826-FHWA 1996, pp. 3-53 and 3-54). To assess nonradiological air quality impacts from branch rail line construction in this air basin, DOE compared emissions from earthmoving activities and vehicles to General Conformity and Prevention of Significant Deterioration thresholds. Appendix G, Section G.1.4.1, describes the method used to determine PM_{10} emissions from earthmoving activities. This method takes no credit for dust suppression measures; however, the analysis for transportation construction activities included dust suppression measures. Appendix G, Section G.1.4.5 describes the method used to determine criteria pollutant emissions from construction vehicle activity which, for the Valley Modified Corridor, would consume an estimated 7.1 million liters (about 1.9 million gallons) of diesel fuel and 150,000 liters (38,000 gallons) of gasoline in the nonattainment area over the length of the construction period.

Eighty-four kilometers (52 miles) of the total 160 kilometers (98 miles) of a branch rail line in the Valley Modified Corridor would be in the nonattainment area. Table 6-72 lists emission rates of PM_{10} and carbon monoxide from earthmoving activities and vehicle emissions in the nonattainment area assuming a work crew completed this section over 21 months and used standard construction techniques. There would be five borrow areas, five spoils areas, and one construction camp along the 84-kilometer (52-mile) construction corridor. Estimated emission rates would exceed the PM_{10} General Conformity threshold for a nonattainment area (see Table 6-73). The PM_{10} exceedance would primarily be the result of earthmoving activities. Dust abatement measures, assumed to be 70 percent effective (DIRS 155557-Clark County 2001, p. 4-63), would reduce emissions by a significant amount.

Table 6-72. Emission rates from Valley Modified Corridor construction in the nonattainment area.

Activity and emission	Emission rate (kilograms per year)
Earthmoving, PM_{10}	110,000
Vehicle, PM_{10}	14,000
Vehicle, carbon monoxide	98,000

a. To convert kilograms to pounds, multiply by 2.2046.

Table 6-73. Particulate matter (PM_{10}) and carbon monoxide air quality impacts (kilograms per year)[a] from Valley Modified Corridor construction in the nonattainment area.

Criteria pollutant/threshold	Threshold level[b]	Percent of threshold[c]		
		Earthmoving	Vehicles	Total
PM_{10}				
General Conformity	63,500 (serious)	170	22	190
Prevention of Significant Deterioration	227,000	48	6	54
Carbon monoxide				
General Conformity	90,700	NA[d]	110	110
Prevention of Significant Deterioration	227,000	NA	43	43

a. Kilograms per year; to convert kilograms to pounds, multiply by 2.2046.
b. Sources: 40 CFR 52.21 and 93.153.
c. Numbers are rounded to two significant figures.
d. NA = not applicable.

If DOE selected the Valley Modified Corridor for the construction and operation of a branch rail line, the final plans, specifications, and estimates would require adherence to the Clark County Health District PM_{10} emissions control measures. These measures are being developed in the Particulate Matter State Implementation Plan (DIRS 155557-Clark County 2001, all). Implementation of the comprehensive measures should enable rail line construction to start. The purpose of the measures under development is

not to prohibit construction activity, but to enable it within the Environmental Protection Agency air quality requirements. Because the estimated impacts to air quality in the Las Vegas Valley air basin would exceed the General Conformity thresholds for carbon monoxide and PM_{10} in a nonattainment area, DOE would have to implement mitigation measures if it selected the Valley Modified Corridor. Under the construction design analyzed above, one crew at a time would construct the branch rail line from beginning to end over about 40 months, and the emissions in the Las Vegas Valley air basin would occur over about 21 months. A potential mitigation measure would be to have two crews construct the line at half the pace from each end of the corridor. Under this plan, the emissions in the basin would occur over the full 40 months, which would result in a decrease of about half in the emission rates, which would reduce the impacts listed above to levels at or less than the General Conformity thresholds. In addition, as part of final construction planning DOE would plan to use dust control measures and ensure fuel efficiency to reduce emissions. These measures should result in emissions below the General Conformity threshold levels.

The Valley Modified Corridor includes the Indian Hills Alternate, Sheep Mountain Alternate, and Valley Connection. The Sheep Mountain Alternate and Valley Connection are entirely in the nonattainment area, whereas only half of the Indian Hills Alternate is in the nonattainment area. The rail extents of the Indian Hill Alternate and the Valley Modified Corridor in the nonattainment area are equivalent. Therefore, no greater or smaller air quality impacts would result from selection of the Indian Hill Alternate. The Sheep Mountain Alternate and Valley Connection, if used, would add 3 and 7 kilometers (1.9 and 4.3 miles) of rail, respectively, to the length of the Corridor. Therefore, air quality impacts would be slightly but not significantly (less than 10 percent) greater if these variations were used.

Operations. Fuel consumption by diesel train engines operating along the rail corridor would emit carbon monoxide, nitrogen dioxide, and particulate matter (PM_{10} and $PM_{2.5}$). Based on the Federal standards for locomotives (40 CFR 92.005), there are no emission standards for sulfur dioxide.

In attainment areas, the pollutant concentrations in the air would increase slightly during the passage of a train, but the emissions from one or two trains a day would not exceed the ambient air quality standards. However, the Valley Modified Corridor would include a route through the Las Vegas Valley air basin, which is in nonattainment for carbon monoxide and PM_{10}. The air quality impacts to this air basin from train operation along the Valley Modified Corridor would be a small contribution in comparison to the amount of pollutants emitted by automotive travel in the basin. Thus, emissions from train operations in the Las Vegas Valley air basin would not produce further violations of the ambient air quality standards.

6.3.2.2.5.3 Valley Modified Rail Hydrology

Surface Water

Chapter 3, Section 3.2.2.1.3, notes that there are no surface-water resources along the Valley Modified Corridor, including its variations.

Table 6-74 lists flood zones identified along the Valley Modified Corridor and its variations. The Federal Emergency Management Agency maps from which DOE derived the flood zone information provided coverage for about 75 percent of the corridor length. The corridor crosses only two different 100-year flood zones or flood zone groups before entering the Nevada Test Site. Of the three variations, the Indian Hills Alternate would lessen the number of flood zones to one; the other two segments would have no change. As indicated in Section 6.3.2.1, impacts associated with altering drainage patterns or changing erosion and sedimentation rates or locations would be minor and localized.

Groundwater

Construction. The water used during construction would come largely from groundwater resources. The annual demands would be a fraction of the perennial yields of most producing aquifers (Chapter 3,

Table 6-74. 100-year flood zones crossed by the Valley Modified Corridor and its variations.[a,b]

Corridor portion	Crossing distance (kilometers)[c]	Flood zone feature(s)	Avoided by variation[d] (Yes or No)
Dry Lake to Yucca Mountain	0.1[e]	Unnamed creek NW of the city of Las Vegas (intermittent)	N
	1.2[f]	Drainage (projected) west of Indian Springs Air Force Auxiliary Base (intermittent)	Y-3
Variation			
1. Valley Connection	None	Located at the origin of the corridor	
2. Sheep Mountain Alternate	None	Located to the north of the corridor	
3. Indian Hills Alternate	None	Located to the south of the corridor	

a. Areas where natural floodwater movement could be altered and where erosion and sedimentation rates and locations could change. Sources:
   1. Federal Emergency Management Agency Flood Insurance Rate Maps for Clark and Nye Counties, Nevada.
   2. DIRS 154961-CRWMS M&O (1998, all).

b. Approximately 25 percent of the Valley Modified Corridor is not available on Federal Emergency Management Agency maps because that portion of the route is on the Nevada Test Site and the Nellis Air Force Range.

c. To convert kilometers to miles, multiply by 0.62137.

d. Certain 100-year flood zones can be avoided by corridor variations. These are identified with a "Y" (yes) and a number representing the specific variation(s) from the second half of the table that avoids the specific flood zone.

e. Limited information due to the Nellis Air Force Range.

f. Projected from limited data. Specific area not covered by Federal Emergency Management Agency maps; values were extrapolated from the closest maps.

Section 3.2.2.1.3, discusses estimated perennial yields for the hydrographic areas over which the Valley Modified corridor passes).

The estimated amount of water needed for construction of a rail line in the Valley Modified Corridor for soil compaction, dust control, and workforce use would be about 395,000 cubic meters (320 acre-feet) (DIRS 104914-DOE 1998, all). For planning purposes, DOE assumed that this water would come from 20 groundwater wells installed along the corridor. The average amount of water withdrawn from each well would be approximately 20,000 cubic meters (16 acre-feet). Most (90 percent) of the water would be used for compaction of fill material. The estimate of fill quantities needed for construction would vary if DOE used either of the variations. The Indian Hills Alternate would increase the total water demand for the Valley Modified Corridor, but only by 6 percent.

Chapter 3, Section 3.2.2.1.3, discusses the hydrographic areas over which the Valley Modified Corridor would pass, their perennial yields, and whether the State of Nevada considers each a Designated Groundwater Basin. If the hydrographic area is a Designated Groundwater Basin, permitted groundwater rights approach or exceed the estimated perennial yield, depleting the basin and water resources or requiring additional administration. Table 6-75 summarizes the designation status of the hydrographic areas associated with the Valley Modified Corridor and the approximate portion of the corridor that passes over Designated Groundwater Basins. Use of either variation would make no notable change in the status of hydrographic areas crossed.

Table 6-75. Hydrographic areas along the Valley Modified Corridor and its variations.[a]

Corridor description	Hydrographic areas	Designated Groundwater Basins	
		Number	Percent of corridor length
Valley Modified Corridor	6	3	70
Variations	6	3	70

a. All three variations (Indian Hills Alternate, Sheep Mountain Alternate, and Valley Connection) would cross the same six hydrographic areas (two with slightly different crossing distances) and the same three designated groundwater basins which, rounded to the nearest 10 percent, would represent the same portion of the total corridor.

The withdrawal of 20,000 cubic meters (16 acre-feet) a year from a well would have little impact on the hydrographic areas associated with the corridor based on their perennial yields (Chapter 3, Section 3.2.2.1.3). However, the installation of 20 wells along the corridor would mean that hydrographic areas would have multiple wells. As indicated in Table 6-75, about 70 percent of the corridor length is over Designated Groundwater Basins, which the Nevada State Engineer's office watches carefully for groundwater depletion. This does not mean that DOE could not obtain water appropriations in these areas; the State Engineer would have the authority to approve such appropriations. Because the DOE requests would be for a short-term construction action, the State Engineer would have even more discretion. Rather than spacing the wells evenly along the corridor, DOE could use locations that would make maximum use of groundwater areas that are not Designated Groundwater Basins. With such a large portion of the corridor over these basins, however, this would mean trucking water for long distances. Another option would be to lease temporary water rights from individuals along the corridor. Obtaining a water appropriation from the State Engineer for short-term construction use or using an approved allocation should ensure that groundwater resources are not adversely affected.

As an alternative, DOE could transport water by truck to meet construction needs. The construction of a branch rail line in the Valley Modified corridor would require about 21,000 tanker-truck loads of water or about 20 truckloads each day. Again, water obtained from permitted sources, which would provide water in allocations determined by the Nevada State Engineer, would not affect groundwater resources.

Operations. Operations along a completed rail line would have little impact on groundwater resources. Possible changes in recharge, if any, would be the same as those at the completion of construction.

6.3.2.2.5.4 Valley Modified Rail Biological Resources and Soils

Construction. The construction of a rail line in the Valley Modified corridor, including its variations, would disturb approximately 5 square kilometers (1,200 acres) of land (Table 6-71). The analysis assumed that the types of land cover in disturbed areas outside the corridor would be the same as that within the corridor. Table 6-76 compares the approximate area of disturbance in each land-cover type along the Valley Modified Corridor, including its possible variations, to the amount of land area within each land-cover type in Nevada. In addition, the table lists the percentage of the area that would be disturbed. The fraction disturbed for each cover type would be very small. The disturbance would not have a discernible impact on any land-cover type. Although some alignment variations could lead to a small increase in the total amount of land disturbed, the portion of the corridor, including its variations, in each land-cover type would be similar to that in the corridor.

This corridor, including its variations, passes through desert tortoise habitat along its entire length, so construction activities would disturb approximately 5 square kilometers (1,200 acres) of desert tortoise habitat, some of which is designated as critical habitat. Construction activities could kill individual desert tortoises, and the presence of a rail line could disrupt movements of individuals. However, desert tortoise abundance is low along this corridor (DIRS 101521-BLM 1992, Map 3-13; DIRS 101914-Rautenstrauch and O'Farrell 1998, pp. 407 to 411) so losses would be few, and would be unlikely to affect the regional population. Relocation of tortoises along the route prior to construction would minimize losses of individuals. The long-term presence of a rail line could block movements of individual tortoises. DOE would consult with the Fish and Wildlife Service (under Section 7 of the Endangered Species Act) regarding this species if it selected this corridor, and would implement all terms and conditions required by the Service.

Two populations of Parish scorpionweed and one of Ripley's springparsley (a Bureau of Land Management sensitive species) occur in the corridor and could be affected directly or indirectly by land-clearing activities. The locations of these populations would be identified though surveys prior to disturbance and would be avoided to the extent possible.

Table 6-76. Maximum area disturbed (square kilometers)[a] in each land-cover type for the Valley Modified Corridor.[b,c]

Land cover type	Percent of corridor length	Area disturbed	Area in Nevada	Percent disturbed
Agriculture	0.0	0.00	5,200	0.00
Blackbrush	0.0	0.00	9,900	0.00
Creosote-bursage	79.0	4.03	15,000	0.026
Grassland	0.0	0.00	2,800	0.00
Greasewood	0.0	0.00	9,500	0.00
Hopsage	0.0	0.00	630	0.00
Juniper	0.0	0.00	1,400	0.00
Mojave mixed scrub	15.9	0.81	5,600	0.014
Pinyon-juniper	0.0	0.00	15,000	0.00
Playa	0.6	0.03	7,000	<0.001
Sagebrush	0.0	0.00	67,000	0.0
Sagebrush/grassland	0.0	0.00	52,000	0.0
Salt desert scrub	4.5	0.23	58,000	<0.001
Urban		ND[d]	2,400	ND

a. To convert square kilometers to acres, multiply by 247.1.
b. Based on the proportion of the route in each land-cover type; percent disturbed was based on the variation with the greatest disturbance within a particular land-cover type. Percentages add to more than 100 because maximum values were used.
c. Source: DIRS 104593-CRWMS M&O (1999, Appendix D).
d. ND = not determined.

There are 46 populations of 11 sensitive plant species outside of the 400-meter (0.25-mile)-wide corridor, but within 5 kilometers (3 miles) of Sheep Mountain Alternate (see Appendix J, Section J.3.1.2 for a list of corridor variations). An additional five populations of two sensitive plant species are outside the corridor but within 5 kilometers of the Indian Hills Alternate. The use of either alternate would avoid one population of desert bearpoppy. These populations would not be affected because land disturbance would not extend to these areas and changes would be unlikely in the aquatic or soil environment as a result of construction or the long-term presence of a railroad.

Several designated game habitat areas for bighorn sheep, mule deer, or quail occur within 5 kilometers (3 miles) of the corridor. Larger game animals occupy large home ranges and could easily traverse the distance between the designated habitat and the corridor. Construction activities probably would disturb individuals or groups of animals and they would avoid construction areas.

The Indian Hills Alternate would cross one herd management area for wild horses and burros (DIRS 104593-CRWMS M&O 1999, p. 3-29). Construction in this area would result in the loss of a small amount of habitat and probably would disturb animals or their movements for the duration of the activity.

No springs, perennial streams, or riparian areas occur in this corridor or its variations and, therefore, impacts to biological resources associated with these areas and located within 5 kilometers (3 miles) of the corridor would be unlikely. The corridor and variations cross a number of ephemeral streams that may be classified as waters of the United States, although no formal delineations have been made (DIRS 104593-CRWMS M&O 1999, p. 3-29). DOE would work with the U.S. Army Corps of Engineers to minimize impacts to these areas and would obtain individual or regional permits, if necessary. Some changes to local drainage along a branch rail line would be likely; DOE would design the rail line to accommodate existing drainage patterns.

This corridor would cross two Wilderness Study Areas. Construction of a railroad in these areas would be incompatible with a Wilderness designation. Although the Bureau considers these Wilderness Study

Areas unsuitable for inclusion in the National Wilderness System, DOE would have to consult with the Bureau before it could build a branch rail line.

Soils in and adjacent to the corridor would be disturbed on approximately 5 square kilometers (1,200 acres) of land during construction of the railroad. Impacts to soils in the corridor [4.4 square kilometers (1,100 acres)] would be small, but could occur throughout construction. Impacts to disturbed areas outside the corridor would be transitory. DOE could reclaim these areas as practicable.

Shrink-swell soils occur along much of the corridor, including its variations, as does the potential for blowing soils. The presence of such soils could influence the amount of area disturbed by construction because soils in the vicinity of the railroad would have to be stabilized. Disturbance during construction would increase the amount of soil that could be transported by wind because the existing vegetation would be disturbed, at least temporarily. Revegetation after construction or other means of soil stabilization could minimize the amount of wind-borne soil.

As stated in Chapter 3, Section 3.2.2.1.4, variations identified for the Valley Modified Corridor could avoid some biological resources, as listed in Table 6-77.

Table 6-77. Biological resources avoided by Valley Modified Corridor variations.[a]

	Occurrence of resource			
	For unvaried segment of corridor		Occurrence avoided by variation	
Alignment variation resource	In corridor[b]	Within 5 km[c]	In corridor	Within 5 km
Sheep Mountain Alternate				
Sensitive species–desert bearpoppy	0	1	0	11
Indian Hills Alternate				
Sensitive species–desert bearpoppy	0	1	0	11

a. Variations listed are those that would result in the avoidance of biological resources along the corridor.
b. In the corridor [or springs within 400 meters (0.25 mile)], but avoided by the variation.
c. Within 5 kilometers (3 miles) of the corridor, but more than 5 kilometers from the variation.

6.3.2.2.5.5 Valley Modified Rail Cultural Resources

Construction. Cultural field studies in the area of the Valley Modified Corridor indicated that the area crossed by the corridor has the potential for relatively high densities of archaeological and historic sites. The corridor, including the Sheep Mountain Alternate, passes within 3 kilometers (1.9 miles) of three properties listed on the *National Register of Historic Places*: Tule Springs Archaeological Site, Tule Springs Ranch District, and the Corn Creek Campsite (DIRS 155826-Nickens and Hartwell 2001, Table 6). Direct impacts on these properties from rail line construction activities would be unlikely. The Bureau of Land Management Las Vegas District predicts that the Indian Springs Valley has the highest possible density of unrecorded significant cultural resources in Clark County. An archaeological records search yielded 19 previously recorded sites along the corridor and its variations (see Appendix J, Section J.3.1.2), 11 of which are considered potentially eligible for the *National Register of Historic Places* (Chapter 3, Section 3.2.2.1.5). Known historic sites that could be affected by rail construction activities include early railroad construction camps along the Union Pacific line near Apex and the historic Las Vegas and Tonopah Railroad (unvaried corridor segment, Sheep Mountain Alternate, and Indian Springs Alternate), as well as the original grade of that railroad. This corridor passes through Camp Desert Rock, a significant historic military site southwest of Mercury.

The Southern Paiute used Indian Springs Valley. There were several early historic period villages at springs such as Indian Springs, Tule Springs, and Corn Creek, and at other locations north of Las Vegas. Some of these locations could be affected by rail line construction activities along the corridor or the Sheep Mountain or Indian Hills Alternates.

The Valley Modified Corridor passes within about 1 kilometer (0.6 mile) of the Las Vegas Paiute Indian Reservation in the northeastern part of the Las Vegas Valley. The corridor would not affect identified cultural resources on the reservation.

Operations. As stated in Section 6.3.2.1, additional impacts to these resources during the operation of the branch rail line would be unlikely.

6.3.2.2.5.6 Valley Modified Rail Occupational and Public Health and Safety

Construction. Industrial safety impacts on workers from the construction and use of the Valley Modified branch rail line would be small (Table 6-78). The analysis evaluated the potential for impacts in terms of total reportable cases of injury, lost workday cases, and fatalities to workers from construction and operation activities. The analysis also evaluated traffic fatality impacts that would occur during the moving of equipment and materials for construction, worker commutes to and from construction sites, and transport of water to construction sites if wells were not available (Table 6-79).

Table 6-78. Impacts to workers from industrial hazards during rail construction and operations for the Valley Modified Corridor.

Group and industrial hazard category	Construction[a]	Operations[b]
Involved worker		
Total recordable cases[c]	32	73
Lost workday cases	16	40
Fatalities	0.04	0.20
Noninvolved worker		
Total recordable cases	1.9	4.1
Lost workday cases	0.7	1.5
Fatalities	0.002	0.004
Totals		
Total recordable cases	34	77
Lost workday cases	16	41
Fatalities	0.05	0.20

a. Totals for 40 months for construction.
b. Totals for 24 years for operations.
c. Total recordable cases includes injuries and illness.

Operations. Incident-free radiological impacts would occur during the routine transportation of spent nuclear fuel and high-level radioactive waste in the Valley Modified rail corridor. Table 6-80 lists the incident-free impacts, which include transportation along the Valley Modified corridor and along railways in Nevada leading to a Valley Modified branch line. The table includes the impacts of 1,079 legal-weight truck shipments from commercial sites that do not have the capability to load rail casks while operational.

6.3.2.2.5.7 Valley Modified Rail Socioeconomics

The following paragraphs discuss potential socioeconomic impacts associated with the construction and operation of a branch rail line in the Valley Modified Corridor.

Construction. The length of the Valley Modified Corridor, 159 kilometers (98 miles), is the most important factor that would determine the number of construction workers required. The construction of a branch rail line in this corridor would require workers laboring for approximately 810,000 hours or 405 worker years during the 40-month construction period. This rail line would require two temporary construction camps to house workers (DIRS 104595-CRWMS M&O 1999, all).

Employment

DOE anticipates that the total (direct and indirect) employment in the region of influence would peak in 2007 at about 245 jobs. Approximately 243 of the workers would come from Clark County, 2 from Nye County, and none from Lincoln County. The increase in employment would represent less than 1 percent of the employment baselines. Employment of Valley Modified Corridor construction workers and some indirect support workers would end in 2009. As a result, the projected total growth (2009 to 2010) of 15,240 jobs in the region of influence would be reduced by 191. The expected addition of 14,886 jobs in Clark County would be reduced by 189, and the expected growth of 330 jobs in Nye County would be reduced by 2. The expected growth of 24 jobs in Lincoln County would be unaffected. DOE anticipates

Table 6-79. Estimated number of fatalities from construction material delivery vehicles and construction and operations worker commuting traffic for the Valley Modified Corridor.

Activity	Kilometers[a]	Traffic fatalities	Emissions fatalities
Construction[b]			
Material delivery vehicles	8,000,000	0.1	0.02
Commuting workers	24,000,000	0.2	0.03
Subtotals	*32,000,000*	*0.4*	*0.05*
Operations[c]			
Commuting workers	52,000,000	0.5	0.07
Totals	***84,000,000***	***0.9***	***0.12***

a. To convert kilometers to miles, multiply by 0.62137.
b. Totals for 40 months for construction.
c. Totals for 24 years for operations.

Table 6-80. Health impacts from incident-free Nevada transportation for the Valley Modified Corridor implementing alternative.[a]

Category	Legal-weight truck shipments	Rail shipments	Totals[b]
Involved workers			
Collective dose (person-rem)	38	670	710
Estimated latent cancer fatalities	0.02	0.27	0.28
Public			
Collective dose (person-rem)	7	20	26
Estimated latent cancer fatalities	0.003	0.01	0.01
Estimated vehicle emission-related fatalities	0.002	0.009	0.011

a. Impacts are totals for 24 years.
b. Totals might differ from sums of values due to rounding.

that project-related workers not moving to Valley Modified Corridor operational jobs would be absorbed in other work in the State. These changes in employment would represent less than 1 percent of the applicable baselines.

Population

Population increases in the region of influence from the construction of a Valley Modified branch rail line, which would lag behind increases in employment, would peak in 2009 at about 219 persons. About 216 persons would reside in Clark County and 3 in Nye County. Population increases would be unlikely in Lincoln County. The impact to the population would be less than 1 percent of the Clark and Nye County population baselines. Because the expected increase in population would be so small and transient, impacts to schools or housing would be unlikely.

Economic Measures

Real disposable income, Gross Regional Product, and State and local government expenditures would rise during construction. The expected peak change in annual levels of these economic measures in the region of influence for a Valley Modified Corridor would be about $7.4 million in 2009 for real disposable income; $12.5 million in 2007 for Gross Regional Product; and $722,000 in 2009 for State and local expenditures. The impacts of these changes would be primarily confined to Clark County, where the workers would live and where they would purchase goods and services. The construction-related impacts would be less than 1 percent of the baseline values for all measures. (Dollar values reported in this section are in 2001 dollars unless otherwise stated.)

Transition and Operations Period. As the economy bridged the period between construction and operation of a Valley Modified branch rail line, the region of influence would continue to experience growth in the labor force and in residential population.

Employment and Population

Estimated direct employment for the operation of a branch rail line in the Valley Modified Corridor would average 36 workers. Total increase in employment in the three-county region of influence would average about 52 jobs over the 24-year operations period (2010 to 2033). DOE anticipates that all jobs would be in Clark County. In the region of influence, the average change in population during operations would be about 137 persons, 134 of whom would reside in Clark County. The impact to Clark County population and employment would be less than 1 percent of the baselines. Because the impact from increases in employment and population would be small, impacts to schools or housing would be unlikely.

Economic Measures

In the region of influence the greatest estimated increase in real disposable income attributable to the operation of a branch rail line in the Valley Modified Corridor ($3.6 million) would occur in 2033; the average increase for the 24-year operation would be $3.1 million. The change in real disposable income would be less than 1 percent of the baseline in the three counties. The average increase in Gross Regional Product would be about $3.6 million, or less than 1 percent of the baselines. The average State and local government expenditures would be approximately $482,000. The impact of additional expenditures by State and local governments would be less than 1 percent of the baselines. Virtually all of the economic activity related to the branch rail line would occur in Clark County.

The results of the detailed analysis performed for the Valley Modified Corridor, driven by the length of the corridor, are representative of the variations listed in Appendix J, Section J.3.1.2. The lengths of the variations are similar those listed in Table 6-71.

6.3.2.2.5.8 Valley Modified Rail Noise and Vibration

The Valley Modified Corridor passes north of Las Vegas and follows U.S. Highway 95 west past the small communities of Indian Springs, Cactus Springs, and Mercury (a Federal installation). Over its full length, the corridor is on Federal land set aside for use by DOE or the U.S. Air Force or managed by the Bureau of Land Management. Land west of the North Las Vegas area has few farms and most of the land is undeveloped.

The corridor meets the Union Pacific mainline near the Apex and Dike sidings in northeast Clark County. The County and the Bureau of Land Management have set aside land for an industrial park in this area. The nighttime noise benchmark of 50 dBA would be exceeded by estimated noise levels north of Las Vegas (Table 6-81). The corridor passes within 1 kilometer (0.6 mile) of the Las Vegas Paiute Indian Reservation. The Indian Hills Alternate (Appendix J, Section J.3.1.2) passes about 0.5 kilometer (0.3 mile) south of the Nevada penal institution at Indian Springs. Estimated noise levels at the penal institution from the Indian Springs Alternate would be 65 dBA.

Because a branch rail line would pass near some communities (including the Indian Springs penal institution), there would be a potential for noise impacts from both construction and operations. Corridor variations west of Indian Springs would not affect rural communities (Appendix J, Section J.3.1.2). The estimated population residing within 2 kilometers (1.3 miles) of the Valley Modified Corridor in 2035 would be about 190 persons. As discussed in Section 6.3.2.1, in areas where a branch rail line or variation passes near a community, train speeds could be limited to the extent necessary to ensure that noise was below levels listed as accepted noise standards.

Vibration. The Valley Modified branch rail line and its variations would be distant [more than 200 meters (660 feet)] from historic structures and buildings. There are no known ruins of cultural significance along the corridor. Therefore, vibration impacts to structures would be unlikely. The small number of trips (two per day) and the small train size would result in low levels of rail-induced ground vibration.

Table 6-81. Estimated propagation of noise (dBA) from the operation of a waste transport train with two locomotives in communities near the Valley Modified Corridor.[a]

Corridor/community	Distance (kilometers)[a]	Estimated noise (dBA)[b]
Valley Modified		
North Las Vegas	1	57
Indian Springs	1.6	48.1
Cactus Springs	1.8	45.5
Indian Springs Alternate		
Indian Springs	2[c]	43.1
Cactus Springs	4[c]	27.6
Mercury[d]	2[c]	43.1

a. To convert kilometers to miles, multiply by 0.62137.
b. Estimated values do not include noise loss due to interactions with the ground that could account for decreases in estimated noise levels of from 10 to 20 dBA at 100 meters (330 feet) from the tracks.
c. Noise estimates at distances greater than 2 kilometers (1.2 miles) have large uncertainty.
d. Federal installation.

6.3.2.2.5.9 Valley Modified Rail Utilities, Energy, and Materials

Table 6-82 lists the use of fossil fuels and other materials in the construction of a Valley Modified branch rail line.

Table 6-82. Construction utilities, energy, and materials for a Valley Modified branch rail line.

Route	Length (kilometers)[a]	Diesel fuel use (million liters)[b]	Gasoline use (thousand liters)	Steel (thousand metric tons)[c]	Concrete (thousand metric tons)
Valley Modified	160	13 - 14	270 - 280	22 - 23	130

a. To convert kilometers to miles, multiply by 0.62137.
b. To convert liters to gallons, multiply by 0.26418.
c. To convert metric tons to tons, multiply by 1.1023.

6.3.3 IMPACTS OF NEVADA HEAVY-HAUL TRUCK TRANSPORTATION IMPLEMENTING ALTERNATIVES

This section describes the analysis of human health and safety and environmental impacts for five implementing alternatives that would employ heavy-haul trucks to transport rail shipping casks containing spent nuclear fuel and high-level radioactive waste in Nevada. DOE has identified five highway routes in Nevada for potential use by the heavy-haul trucks to transport the casks. The casks would be transported to the repository from an intermodal transfer station along a mainline railroad where they would be loaded onto the heavy-haul trucks from railcars. The trucks would also transport empty casks from the repository back to the intermodal transfer station for loading back onto railcars.

INTERMODAL TRANSFER STATION AND NAVAL SPENT NUCLEAR FUEL

Under the mostly legal-weight truck scenario, DOE would use the services of a commercial intermodal operator for the transfer of naval spent nuclear fuel shipments. This EIS assumed that DOE would not build an intermodal transfer station to handle those shipments. Because only 300 naval spent nuclear fuel casks would arrive in Nevada by rail over 24 years, the impacts of intermodal transfer operations would be considerably less than those for the mostly rail scenario. On average, the intermodal transfers would occur for about 2 weeks every 5 months to remove five casks from each train shipment. A staff of 20 would work only during these rail shipments.